LONG POINT REGION CONSERVATION REPORT

A supplement to Big Creek Conservation Report

DEPARTMENT OF THE ENVIRONMENT

CONSERVATION AUTHORITIES BRANCH

Department of the Environment

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ONTARIO

TORONTO

1972

A scenic view of the Lake Erie shoreline south-east of Selkirk in the Big Creek extension area.

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INTRODUCTION

The Big Creek Conservation Authority was originally established by Order-in-Council 1585/48 on September 9, 1948, to cover the watershed of Big Creek only. The Authority was subsequently enlarged by OC 2059/54 on August 5, 1954, to become the Big Creek Region Conservation Authority. Surveys of the area then under jurisdiction of the Conservation Authority were carried out by the Conservation Authorities Branch and reports issued in 1953, 1959 and 1963.

On January 2, 1969, by OC 12/69, the Authority was again extended to take in all the area east of the previous Authority as far as the boundary of the Grand River Conservation Authority. The results of the survey of this extension area, carried out in 1969, are covered in the following report.

Subsequent to this survey, the Big Creek Region Conservation Authority was amalgamated with the Otter Creek Conservation Authority on November 5, 1970, by OC 3367/70 to form the Long Point Region Conservation Authority.

N. D. Patrick,
Director,
Conservation Authorities Branch,
Department of the Environment.

CHAPTER 1

LAND USE

The typically flat topography of the Big Creek Region Conservation Authority is even more pronounced in the new extension area. At the eastern extremities the physiography has been influenced by the underlying limestone bedrock. This bedrock, commonly called the Onondaga formation, lies quite close to the ground surface in the eastern portion of the area but dips towards the south-west. There is therefore greater soil depth in the western section of the extension area.

These variations in soils over the bedrock can be attributed to the various stages of glacial activity that occurred in this region. The deposition of till and lacustrine material created a topography of gently undulating land slopes which is known as the Haldimand Clay Plain. The heavy-textured clay soil of the lacustrine material may create some drainage problems for agriculture. For the most part however the cleared land has been cultivated for forage and corn production to support dairy, beef and mixed farming operations. By contrast, the light-textured soils that support high-value crops such as tobacco in the main Authority area are infrequent in the extension area.

There are approximately 90,240 acres in the extension area, of which all but 860 acres are considered to be of Class I to III agricultural capability rating. Limiting factors for these Class I to III lands include: excessive moisture in the soil, possible inundation by floodwaters, topography and difficulty of tillage. The 860 acres are rated Class VI, due primarily to the shallowness of the soil over the bedrock. These Class VI lands are at the northern and eastern perimeters of the extension area.

Soil Erosion

Soil erosion problems are not always readily apparent. Sheet and rill erosion however definitely occurs on some bare and sloping cultivated fields in the spring, although the flat topography keeps it at a minor level in the growing season. Contour ploughing would reduce soil displacement and stream sedimentation.

The maintaining of headlands between stream banks and the edges of cultivated fields would also ensure that there would be no unnecessary encroachment onto stream banks with bank erosion and silting of streams during heavy spring runoff.

Stream-bank Erosion

The trampling of stream banks by livestock on flood plain lands has contributed to stream-bank erosion within the extension area. Due to the shallow topsoil overlying the bedrock (in some areas only one-half foot to two and one-half feet of soil cover over limestone) the breakdown of the banks tends to increase in a lateral direction. The stream bed then tends to meander more frequently, eroding more of the flood plain.

Exposed banks were observed from 5 feet to 12 feet in height in some locations, and these were subject to cattle damage as well as streamflow activity. Examples are on Sandusk Creek in the vicinity of Concessions III, VII and IX, Walpole Township.

The most noticeable locations of stream-bank damage by livestock are at road crossing culverts, for it is where stream channels have been deepened for construction purposes that water tends to pond. The undulating stream bedrock causes water to collect at such points as they are the low or deep depressions along the stream's course.

The following is a partial list of locations where stream-bank erosion is apparent and will require remedial measures.

Stock watering in stream channels, shown above in Sandusk Creek looking south from Concession VI bridge, causes channel silting and also stream-bank erosion, as shown below in the same creek, looking south from Highway 3.

Cattle Damage

Sandusk Creek	Lots 11 and 12, Conc. X	Walpole Township
	Lots 11 and 12, Conc. IX	
	Lot 12, Conc. VIII	
	Lot 12, Conc. VII	
	Lot 14, Conc. IV	
	Lot 16, Conc. II	
Dry Creek	Lot 16, Conc. II	Walpole Township
	Lot 19, Conc. II	
Stoney Creek	Lot 19, Conc. VIII	Walpole Township
	Lot 21, Conc. VI	
	Lot 3, Conc. II	Rainham Township
Hemlock Creek	Lot 4, Conc. III	Rainham Township
	Lot 6, Conc. III	Rainham Township
Wardells Creek	Lot 21, Conc. II	Rainham Township
	Lot 21, Conc. I	Rainham Township

Emphasis should be placed on controlling livestock access to stream banks. The promotion of by-pass ponds for water supply to domestic animals should be considered by the Authority.

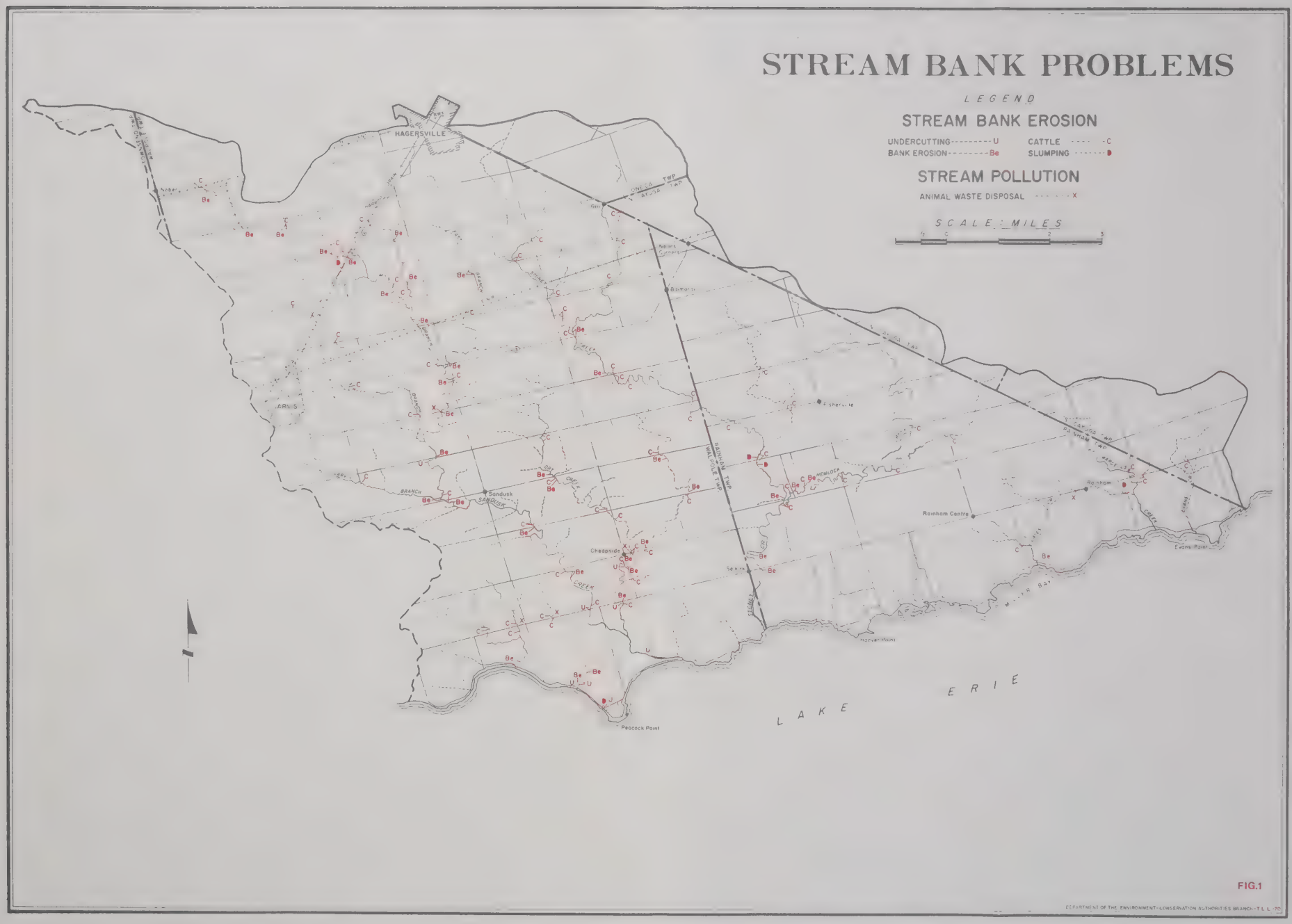
During the engineering survey, a few areas of natural stream-bank erosion were noted on high clay banks at sharp bends in Sandusk Creek, through concessions VI and VII. Stream-bank erosion was generally not major due to the low stream gradients and low stream banks. When flows are large, banks are overflowed and the resulting large cross-sectioned area produces a low velocity of flow.

Examples of bank erosion were found at the following locations:

Bank Erosion

Sandusk Creek	Lot 8, Conc. X	Walpole Township
	Lot 12, Conc. IX	
	Lot 10, Conc. V	
	Lot 15, Conc. II	
Stoney Creek	Lot 19, Conc. VII	Rainham Township
	Lot 1, Conc. II	Rainham Township
Hemlock Creek	Lot 4, Conc. III	Rainham Township
Gates Creek	Lot 15, Conc. I	Rainham Township

Municipal roads were found to contribute greatly to erosion problems. The nature of the Haldimand clay present throughout the area has led roads departments to constantly clean out ditches, and this practice has resulted in unvegetated waterways with fairly steep gradients.


STREAM BANK PROBLEMS
LEGEND
STREAM BANK EROSION
UNDERCUTTING ---------- U
BANK EROSION ---------- Be
CATTLE ---- C
SLUMPING ---- D
STREAM POLLUTION
ANIMAL WASTE DISPOSAL ---- X
SCALE : MILES
HAGERSVILLE
Sandusk
Cheapside
Romham Centre
Peacock Point
LAKE ERIE
FIG.1

Grass Waterways

The need for grass waterways was apparent in some parts of the extension area to provide means of carrying surplus surface water off the fields during periods of heavy runoff. Grass waterways also help control soil erosion and silting along a watercourse.

Grass waterways should normally be situated along natural drainage courses of a field system, and display a parabolic shaped cross-section. This type of cross-section can prevent small flows from excessive meanderings as well as facilitate maintenance of a grass waterway.

A grass waterway should be at least 14 to 16 feet wide to facilitate the clipping of the grass, keeping in mind that heavy farm implements should not traverse the grass waterway during the early spring period.

Some of the shallow drainage ditches in the extension area could be widened into functional grass waterways. These improved ditches could then accommodate unusually heavy runoffs and provide more efficient erosion and sedimentation control measures.

In some places farmers have resorted to deliberate furrowing to create temporary drainage ditches across fields. This method can assist in field drainage but the loss of topsoil then becomes a serious problem due to unnecessary erosion.

Grass waterways would be a more efficient solution for farmers.

Deliberate furrowing was observed at the following locations:

Lot 17, Conc. II,	Walpole Township
Lot 11, Conc. III,	Walpole Township
Lot 19, Conc. I,	Rainham Township
Lots 10 & 12, Conc. V,	Rainham Township
Lot 18, Conc. II,	Rainham Township

A present opportunity for construction of a grass waterway is at lot 17, Concession XII, Walpole Township, where recent field renovation has greatly increased the total acreage. This field is traversed by a drainage ditch which would be suitable for a grass waterway.

A few potential grass waterways have been mapped. The remainder of those shown on Figure 1 were selected by air photo interpretation.

A priority listing for grass waterways should now be established by the Authority. A systematic program on a small watershed basis would also be very useful.

The Big Creek extension area has a number of sites suitable for grass waterways.

A well maintained grass waterway can eliminate soil erosion on sloping fields.

If difficulties are encountered in designing a grass waterway, the owner should be encouraged to obtain advice from the Authority, at which time the correct slope, cross-sectional shape and width can be calculated, based on the runoff area of each field or property.

Lake Erie Shoreline Erosion

The deterioration of the northern Lake Erie shoreline is a recurring problem. The front yards of some cottage properties have been greatly reduced, and some cottages may soon have to be abandoned.

Attempts have been made by private landowners to retain the shoreline banks. Groynes, jetties and other breakwater structures have not provided a satisfactory answer, and recently gabions (stone filled wire baskets) have been used to retain the clay banks. In places where gabions have not been tried, bank erosion is extensive. Elsewhere there has been back-washing action behind the gabions which eventually tilt or topple over.

In addition to this wave-washing action, stream and ditch outletting over the shoreline banks contributes greatly to their breakdown.

It is therefore desirable to have rip-rap or some other material at the base of these outfall points to provide protection for the erosion susceptible Haldimand clay banks.

CHAPTER 2

WATER

Water Resources Planning

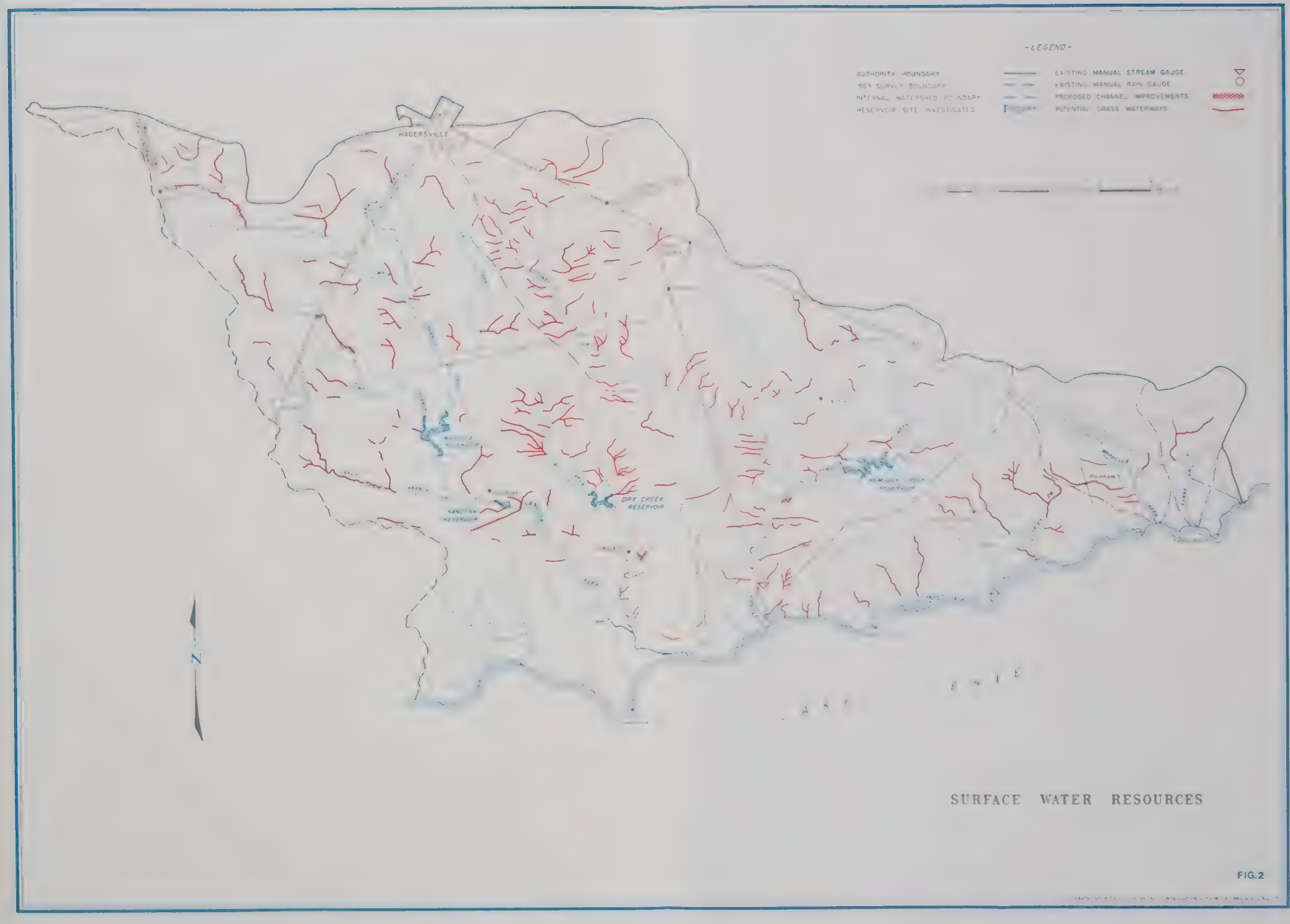
This section is primarily concerned with water and more particularly the control of excess runoff to prevent floods and conserve water for periods of low flow.

Planning requires projecting data available for current needs in such a way that allowance is made for future economic, technological and social changes.

In the case of Haldimand County and the Big Creek extension area, it is already obvious that rapid urban and industrial growth will complicate the process of determining priorities and matching to them available resources.

The Ontario Hydro Generating Station and new Steel Company of Canada plant, both near Nanticoke, together with other anticipated industrial growth, are expected to increase the population of Norfolk and Haldimand Counties from the present 80,000 to perhaps four times that number by the year 2001. The demand for large-scale urban services will obviously necessitate adjustments by local municipal government systems in the near future.

Other data required for water planning projections include long-term rainfall records, streamflow and ground-water levels, and information on flooding and various municipal and agricultural water needs.


-LEGEND-
AUTHORITY BOUNDARY
1969 SURVEY BOUNDARY
INTERNAL WATERSHED BOUNDARY
RESERVOIR SITE INVESTIGATED
EXISTING MANUAL STREAM GAUGE
EXISTING MANUAL RAIN GAUGE
PROPOSED CHANNEL IMPROVEMENTS
POTENTIAL GRASS WATERWAYS
HAGERSVILLE
DRY CREEK RESERVOIR
N
SURFACE WATER RESOURCES
FIG.2

Objectives

As general objectives in water management, the Conservation Authorities Branch adopted flood control, conservation of water for low flow improvement and stream-bank erosion control. Water quality and pollution control, and work with the Ontario Water Resources Commission and participating municipalities in these areas are also important considerations.

Benchmarks

During the course of the reconnaissance engineering survey, benchmarks were established along all the larger streams and their major tributaries. These benchmarks, like those of the Geodetic Survey of Canada and the Department of Highways, give elevation above mean sea level at certain semi-permanent locations. This information is available on request from the Conservation Authorities Branch. Persons responsible for works on or over streams are asked to use elevations given by benchmarks for their reference points. This helps in evaluating any possible effects of works on stream systems.

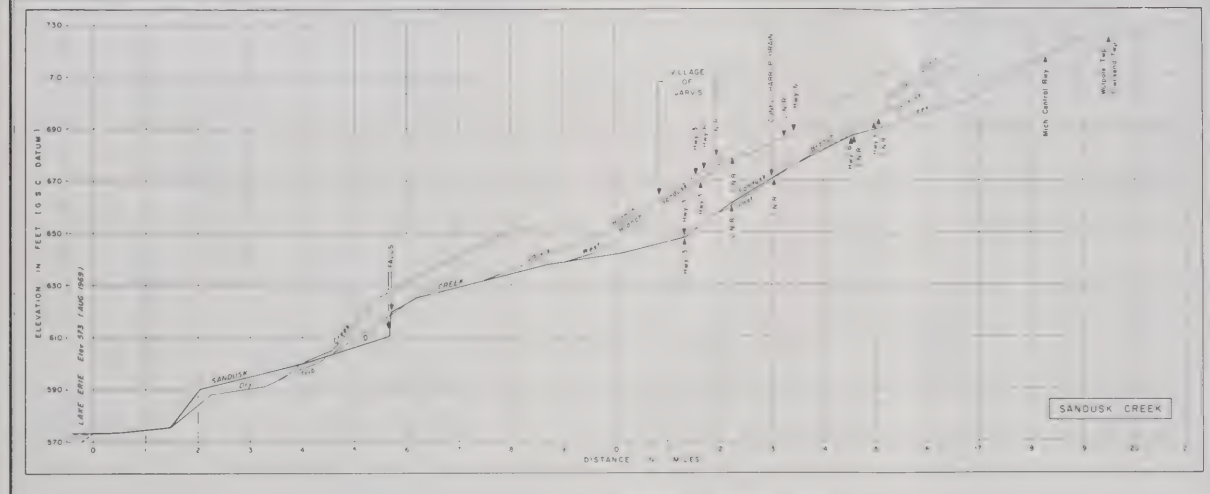
River Descriptions

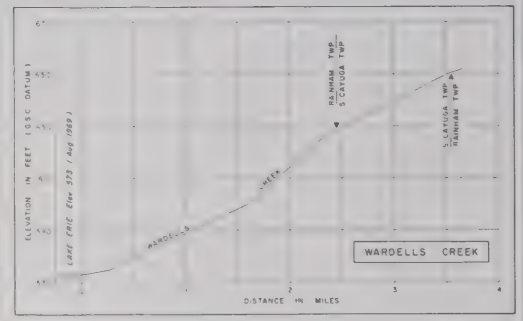
The extension area includes the Sandusk Creek and Stoney Creek watersheds and a number of lesser streams. The river valleys are not well defined and generally are 10 to 15 feet deep with a width of 200 to 400 feet in the lower reaches of the larger streams. In the upper portions of the watersheds the river valleys are non-existent. The Lake Erie shoreline varies in height from 6 to 20 feet.

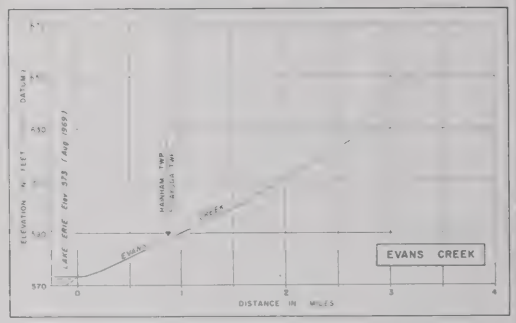
Sandusk Creek

The largest stream, Sandusk Creek, has its source in Concession XIV, Walpole Township, at an elevation of 725 feet above mean sea level. The creek flows southerly through Walpole Township, for a distance of 20.3 miles to empty into Lake Erie one and one-half miles east of Peacock Point. The teardrop shaped watershed has a drainage area of 62 square miles.

There are five tributaries of Sandusk Creek, all of which are shown on the Water Level Profile in Figure 2.

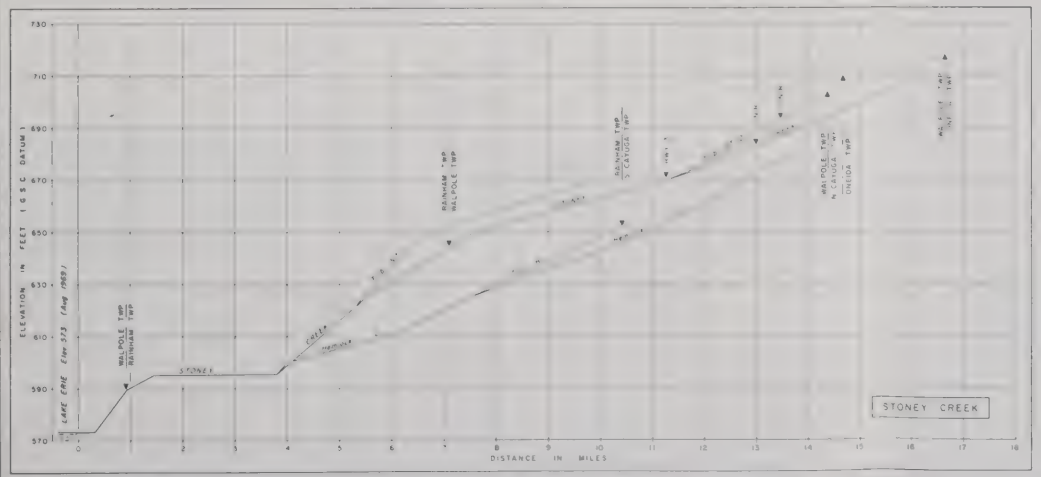






BIG CREEK EXTENSION WATERCOURSE CHARACTERISTICS

WATERCOURSE	TRIBUTARY	DRAINAGE AREA SQ MILES	LENGTH MILES	LENGTH FEET	FALL FEET	AVERAGE SLOPE FT/FT
SANDUSK	MAIN	52.18	20.25	106,920	153	0014
	JARVIS	6.40	5.35	28,248	61	0022
	WEST	7.30	6.45	34,056	78	0023
	EAST	4.90	5.28	27,878	65	0023
	HARROP DRAIN	3.78	3.70	19,536	18	0009
	DRY CREEK	14.46	7.79	41,131	100	0024
STONEY CREEK	MAIN	46.32	17.05	90,024	150	0017
	ST-1	6.65	4.63	24,446	46	0019
	ST-2	5.19	3.88	20,486	52	0025
	HEMLOCK CR	10.78	10.00	52,800	88	0016
	[illegible]	[illegible]	[illegible]	11,216	28	0025
GATES CREEK	MAIN	5.18	2.18	11,510	53	0046
WARDELLS CREEK	MAIN	6.32	3.68	19,430	80	004
EVANS CREEK	MAIN	3.55	3.32	17,530	80	0046



DEVELOPED FROM FIELD SURVEY DATA SUPPLEMENTED BY 1:50,000 NATIONAL TOPOGRAPHIC SHEETS

WATER LEVEL PROFILES
BIG CREEK EXTENSION

SCALES AS SHOWN

FIG.3

Dry Creek, at the first bridge east of Cheapside, typifies an upper watershed stream channel. Here, the channel is much smaller than shown below and will flood under high flows.

Dry Creek, looking north from Cheapside Road, illustrates a typical lower watershed stream channel.

A shallow, broad channel and the absence of a well defined valley are features of the lower Sandusk Creek watershed.

Dry Creek is an intermittent flow stream which drains the lower east half of the watershed from Highway 3, south. It has a total length of 9.2 miles with a fall of 102 feet.

Jarvis Branch of Sandusk Creek starts in Concession IX about a mile north of Jarvis and flows south through Jarvis and easterly to join the main branch at Concession IV. This branch has a length of 5.4 miles and a fall of 61 feet.

The west branch of Sandusk Creek originates just north of the Sprucedale Boys School in Concession XI and flows southerly to join the main branch in Concession VI. It has a total length of 3.7 miles and a fall of 18 feet.

Stoney Creek

Stoney Creek has its headwaters in Concession XII, Walpole Township, at an elevation of 723 feet above mean sea level. The creek flows southerly through Walpole and Rainham Townships, for a distance of 17.1 miles to empty into Lake Erie, 1.8 miles east of the Walpole-Rainham townline. The triangular shaped watershed has a drainage area of 46.3 square miles.

There are three tributaries of Stoney Creek, all of which are shown on the water level profile in Figure 2.

The largest tributary, Hemlock Creek, has its headwaters in Concession VII of Rainham Township and flows south-easterly to Concession IV, one and one-half miles east of Fisherville, and then turns south-westerly to meet Stoney Creek in Concession II of Rainham Township. This tributary has a total length of 10 miles and a fall of 85 feet.

Tributary ST-1 is an intermittent flow stream originating in Concession VII of Rainham Township and flowing southerly for a distance of 4.6 miles to meet Stoney Creek in Concession IV of Rainham Township. This stream has a total fall of 46 feet.

Tributary ST-2 headwaters in Concession I, North Cayuga Township, and flows south-westerly for 3.9 miles to meet Stoney Creek in Concession VIII of Walpole Township just above Highway 3. The total fall of this tributary is 52 feet.

Gates Creek

The Gates Creek watershed has a drainage area of 5.2 square miles with headwaters in Concession III of Rainham Township and empties into Lake Erie at Miller Bay. The total length of the watercourse is 2.2 miles with a fall of 53 feet.

Wardells Creek

Wardells Creek has a drainage area of 6.5 square miles with a total length of watercourse of 3.7 miles and a fall of 80 feet. The creek originates in Concession V of South Cayuga Township and empties into Lake Erie 1.1 miles west of Evans Point.

Evans Creek

The 3.6-square-mile drainage area of Evans Creek is the most easterly watershed in the Big Creek extension. The stream originates in Concession V of South Cayuga Township and empties into Lake Erie 0.4 miles west of Evans Point. It has a total length of 3.3 miles with a fall of 80 feet.

Water Problems

The extension area's experiences with flooding, low summer flows, water pollution and stream-bank erosion are generally attributable to improper water and watershed management. With the exception at low summer flows, none of these problems are severe, but increasing exploitation of the watershed area is likely to aggravate the situation unless remedial measures are considered now.

Low Summer Flows

The lack of adequate flow in streams, to keep channels free from algae, weed growth and pollution, is perhaps the greatest problem in the extension area.

All the streams below Concession V of Walpole and Rainham Townships are dry with a series of standing pools during the months of June, July, August and September. The sedimentary limestone in this area is the main reason for the standing pools and dry beds. Natural pond areas are formed by the uneven bed profile of the limestone, and its porous nature allows low summer flows to seep into the rock and

flow underground to Lake Erie.

Sandusk Creek receives the effluent from the only three sewage plants in the extension area and there are times when the only flow in the creek is effluent from the Hagersville, Sprucedale Boys School and Jarvis sewage treatment works. The quality of this stream is surprisingly good and this is attributable to the efficiency of these treatment systems.

Hemlock Creek appears to carry the most sustained flow during the low flow period. Its watershed has an above average forest cover and there are a few feeder springs in Concessions III and IV.

The two methods to augment summer flows are: (1) to build a water retension reservoir and release spring runoff over the low flow period, or (2) to improve the watershed runoff characteristics and therefore retain runoff over a longer period of time.

Clay soils and the lack of local swamps, lakes and adequate woodlots are conducive to fast runoff. Rainwater flows quickly away to streams and the lake. Lengthening this runoff time is not a feasible project.

A diversion project bringing water in from outside is even less practical.

Reservoirs are also not a suitable solution in present circumstances. For purposes of low flow augmentation reservoirs must have a large storage capacity. A usable storage of 488 acre-feet would be required to release a flow of two cubic feet per second for a period of 120 days. Of the four reservoir sites investigated during the survey, only Hemlock Creek Reservoir achieved this storage capacity.

Water storage reservoirs, although too expensive in proportion to benefits at present, may prove to be the only solution available as the need for low flow augmentation increases with future urbanization of the area.

Flooding

Flooding becomes a problem when it causes or threatens loss of life and property damage. Most floods occur on plains adjacent to streams and result directly from such natural causes as excessive rainfall and melting snow.

Flooding is minor in the extension area. In the spring, township roads and farm lanes have sometimes become impassable. Farm animals have occasionally been drowned when pastured or kept on flood plains. Minor crop losses have resulted from heavy summer thunder storms where planting has been too near to a natural watercourse.

A comprehensive channel improvement program, followed by regular maintenance in problem areas, would eliminate the type of minor property damage that has been experienced in the past. Figure 1 shows a few areas of minor flooding that could be included under such a program.

Pollution

The major sources of pollution in the extension area are garbage dumps, overflowing septic tanks, storm sewers carrying domestic wastes, certain agricultural practices and silt from erosion. The first three sources have been and are continuing to be investigated by the Department of the Environment.

Specific sources or possible sources of pollution were noted as follows:

1. The Township of Rainham dump site is unacceptable to the Waste Management Branch of the Department of the Environment. It cannot help but be a source of pollution of Wardells Creek. It will be closed down at the earliest opportunity.

2. The Township of Walpole waste disposal site is in the proximity of Sandusk Creek. The management of the site is reasonable. However, should the level of operation be allowed to deteriorate, it might have an adverse effect on the creek. Ground water pollution is not deemed to be a possibility at this site.

3. The Village of Jarvis site is not the most ideal. Storm water is piped through the site under the garbage. Any effect on Sandusk Creek would be minimal.

Cattle are allowed to water directly from streams throughout the area. This has caused minor pollution during periods of low flow. Agricultural fertilizers and insecticides which are washed into streams by heavy rains also contribute to heavy growth of weeds and algae.

The forms of erosion discussed in Chapter 1 produce the

silt load carried and deposited in streams. In some locations silt has completely filled the stream channel and during periods of appreciable flow the water flows overland.

HYDROLOGY

Climatic Characteristics

Important climatic effects are the amount and intensity of rainfall, amount of snow and ice accumulation, radiation, temperature and wind.

Several meteorological stations are in or near the extension area.

Table I shows the monthly mean and extremes in temperature for the stations at Port Dover and Simcoe.

Table II shows the monthly mean precipitation in the form of rainfall, snowfall, and the totals as well as the maximum precipitation in a 24-hour period for the stations at Port Dover and Hagersville.

Streamflow Records

Maximum and minimum flow records and runoff data are necessary for the design of water control works. Unfortunately there are no stream-flow records for the streams under study in this report. The O.W.R.C. installed a staff gauge in Stoney Creek near Selkirk but they do not consider the flow values to be sufficiently accurate.

Floods

An average spring runoff in the extension area consists of about one-half inch from snowmelt and the remainder from rainfall.

Summer and fall floods are less severe than winter and spring floods, but hurricane-generated storms in late summer and fall produce heavy rains that have a high flood producing potential.

The hurricane type storm, "Hazel", of October, 1954, gave torrential rains along its path as it moved northward from the south-eastern U.S. coast across the Niagara Peninsula over Toronto and on into northern Ontario. Severe floods resulted from these rains causing tremendous devastation and loss of life.

The following rainfall totals were recorded in this region

TABLE I

TEMPERATURE SUMMARY PORT DOVER AND SIMCOE

PORT DOVER

		JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	YEAR
Temperature in Degrees Fahrenheit	Mean Maximum	31.7	32.2	39.7	52.8	65.1	75.1	80.4	79.4	71.9	60.4	46.6	35.4	55.9
	Mean Minimum	16.8	16.8	24.0	34.2	43.8	53.7	58.4	57.6	51.3	40.8	31.5	21.4	37.5
	Mean Daily	24.3	24.5	31.9	43.5	54.5	64.4	69.4	68.5	61.6	50.6	39.1	28.4	46.7

SIMCOE

		JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	YEAR
Temperature in Degrees Fahrenheit	Mean Maximum	30.9	31.4	39.6	54.6	66.3	76.9	81.6	79.7	72.0	60.8	45.8	34.2	56.2
	Mean Minimum	16.9	15.4	23.4	34.5	43.4	53.4	58.2	56.2	49.0	39.3	30.7	20.9	36.8
	Mean Daily	23.9	23.4	31.5	44.6	54.9	65.2	69.9	68.0	60.5	50.1	38.3	27.6	46.5

TABLE II

PRECIPITATION SUMMARY PORT DOVER AND HAGERSVILLE

PORT DOVER

	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	YEAR
Mean Rainfall	1.66	1.76	2.27	3.10	2.63	2.75	2.27	2.52	2.66	2.43	2.19	1.74	27.98
Mean Snowfall	8.5	10.2	8.3	1.2	T.	-	-	-	-	0.1	5.0	7.4	40.7
Mean Total Precipitation	2.51	2.78	3.10	3.22	2.63	2.75	2.27	2.52	2.66	2.44	2.69	2.48	32.05
Maximum Precipitation in 24 hrs.	3.20	3.17	2.12	3.48	2.17	3.91	2.72	2.62	2.16	3.73	3.40	2.20	3.91

HAGERSVILLE

	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	YEAR
Mean Rainfall	1.93	1.67	2.03	3.16	2.62	2.36	1.96	3.13	2.62	2.58	2.30	1.58	27.94
Mean Snowfall	10.1	9.1	9.2	1.6	T.	-	-	-	-	0.2	6.9	7.7	44.8
Mean Total Precipitation	2.94	2.58	2.95	3.32	2.62	2.36	1.96	3.13	2.62	2.60	2.99	2.35	32.42
Maximum Precipitation in 24 hrs.	1.48	1.72	1.84	1.53	1.38	1.85	2.04	3.25	1.77	2.87	2.00	1.20	3.25

Note: All precipitation is given in inches.

Total precipitation is rain plus snow assuming that 10" of snow is equivalent to 1" of water.

T. - Trace

from the storm:

	Inches of Rainfall			
Location	Oct. 14	15	16	Total
Hagersville	0.93	2.87	0.33	4.13
Kohler	1.32	3.47	0.17	4.96
Jarvis	0.03	4.17	0.41	4.61

While these amounts were abnormally high, they were less than half those which occurred at the centre of the storm north-west of Toronto on the Humber River watershed.

The runoff occurring from such a storm would by far surpass any normal spring runoff, and this type of extensive flooding which produces extensive downstream damage must be considered in the design of water control structures.

DESIGN FLOWS

A design-flood flow is used in the planning of a water control structure.

i) 100-Year Flood

A flood of this magnitude is expected to occur once in a 100 years, or there is a one per cent chance of its occurrence in any year. It is estimated by frequency analysis of available flow data or by using the unit hydrograph approach as applied to the 100-year storm.

ii) Regional Flood

For Southern Ontario, the regional flood is the customary measure of the effects on a particular drainage basin of a storm such as Hurricane "Hazel" which struck Toronto in October, 1954.

Where adequate storage is available, reservoirs can be designed to contain this excess flow.

iii) Probable Maximum Flood

This flood is estimated from probable maximum rainfall. Design planning is intended to ensure the safety of the dam and the protection of downstream residents from the occurrence of a dam failure.

Flood Control Measures

Effective flood control includes proper land use practices, reforestation, reservoir construction, channel improvements and diversions, dike and flood wall construction, zoning and flood warning systems.

Reservoirs

Although reservoirs are not currently economically justifiable, the area was examined for possible sites. Seven reservoir sites were selected for a reconnaissance survey and four of them for a topographic survey. These are listed in Table III.

Cost estimates were not prepared for these reservoirs. Low flow augmentation was an important consideration during site investigation. Of the four sites, only one, Hemlock Creek reservoir, has the storage capacity to function as a low flow augmentation reservoir.

Considering a low flow period from June 1 to September 30--122 days--as the duration of the storage release program with a flow release of two cubic feet of water per second, a minimum usable storage of 488 acre-feet would be required. The amount by which evaporation exceeds rainfall on the reservoir itself for the low flow period could be equivalent to a drop of six inches or more in the storage or an additional storage requirement of 100 acre-feet.

Hemlock Creek reservoir maximum storage capacity is 600 acre-feet which is within the requirement limits.

Channel Improvements

Flood protection offered by channel improvements ranges from relief from annual spring flooding to "probable maximum storm" protection.

Preliminary surveys suggest that few inhabitants would be protected by straightening and improving channels in potential flood areas.

Consideration should be given to minor channel clearing and dredging at trouble spots shown in Figure 1.

Streams in the lower portions of the watersheds generally have clean, smooth channels founded on bedrock, while those in the upper are of an intermittent flow nature with undersized channels further restricted by vegetation. Sections of these upper watercourses could

TABLE III

BIG CREEK EXTENSION

RESERVOIR SITES INVESTIGATED

RESERVOIR NAME	LOCATION	DRAINAGE AREA (SQ. MILES)	DAM HEIGHT (FEET)	DAM LENGTH (FEET)	MAXIMUM STORAGE CAPACITY (AC.FT.)
Hemlock Creek	Rainham Township Con. III Lots 7-10	11.77	16	600	600
Sandusk	Walpole Township Conc. IV, Lots 13, 14	42.23	11	300	70
Dry Creek	Walpole Township Conc. IV, Lots 17, 18	5.98	22	400	160
Walpole	Walpole Township Conc. VI, Lots 10, 11	31.42	22	1750	350

Vegetation restricts channel capacity as shown at the Harrop Drain looking south from Concession IX. A channel maintenance program would relieve this flood prone area.

Dumping such as this must be stopped: Stumps will float downstream, plug bridge openings and thereby cause flooding.

become grass waterways if the property owners followed regular weed-cutting programs and proper land use practices. Channel capacity would be increased and silting and erosion decreased, therefore reducing flooding.

Flood Plain Zoning and Acquisition

The restriction of development on flood plains to parks, open space or agriculture, allows spillage of flood waters without danger of serious damage.

Some municipalities in the extension area have zoning by-laws which give a limited measure of protection against flood plain encroachment.

CHAPTER 3

PLANNING

Current Planning Administration Status

The planning status of the eight municipalities in the extension area at the end of 1970 is as follows:

	Approved Official Plan	Approved Zoning By-law
South Cayuga Township	None	None
North Cayuga Township	January 16/69	Passed by Council, in process at the Ontario Municipal Board.
Oneida Township	Passed by Council, in process at Department of Municipal Affairs.	Passed by Council, in process at Department of Municipal Affairs.
Walpole Township	June 20/68	Yes
Village of Hagersville	February 27/61	Yes
Village of Jarvis	None	Passed by Council, in process at the Ontario Municipal Board.
Townsend Township	November 19/68	Partial coverage
Woodhouse Township	December 8/70	Passed by Council, in process at Department of Municipal Affairs.

The municipalities are now totally covered by subdivision control under The Planning Act. A municipality may enter into agreements with a subdivider as a condition of subdivision approval to require that certain physical conditions are dealt with in a manner consistent with good engineering and resource management techniques. A municipality may

require specific setbacks from hazardous lands or tops of banks as well as necessary works and remedial measures to protect a site from flooding and/or erosion. The role of the Big Creek Region Conservation Authority in this matter is to provide assistance and advice to municipalities which are at present and will be in the future undergoing urban development.

The interests of the Authority can also be protected by (1) providing up-to-date information on the physical characteristics of the landscape and (2) protecting potential sites for acquisition by making their long range plans known at the time that urban development is proposed.

Present Development

At present most urban development is centred around the Villages of Hagersville and Jarvis. There are some relatively small pockets of unsightly extra-urban development along major highways and township and county roads in the extension area. It is, of course, anticipated that development will accelerate as a result of the Nanticoke, Stelco and Texaco projects and once present planning studies are complete.

Physical Characteristics and Development Applications and Proposals

The high rate of runoff, noted in the chapter on water, could prove disastrous during spring freshet or high precipitation periods in the lower reaches of rivers and watercourses as urbanization increases. It is imperative that the Authority take this into account when reviewing subdivision applications or proposals for urban development adjacent to watercourses.

The existing patterns of watercourses throughout the extension area can be used with limited physical improvements as Open Space boundaries for structuring the size of communities. The drainage pattern therefore would be maintained and utilized to provide the Open Space frameworks which are necessary for adequate buffering and the creation of barriers and boundaries for urban and community development. The Authority should work closely with all planning organizations to ensure this.

The north-easterly boundary of the extension area is considered to be a potential source of building materials and aggregates

and decisions on zoning should therefore be completed at an early time. The management of this physical feature has far-reaching policy implications that will determine whether this area will be predominantly industrial or residential.

The proposed Stelco and Texaco industries will be necessarily located along shoreline areas. Vast amounts of water for cooling and processing are essential to refining, smelting and electric power generation. These industries also require easy access to bulk transfer of raw materials transported by ship, together with large amounts of space for bulk storage and pier facilities.

Future conflicts are anticipated as a result of competition for shoreline and shoreline access between industry and recreation. The shoreline is composed of bluffs and high banks formed of bedrock and clay along the total length. When coupled with the fairly high rates of erosion in evidence along the length of the shoreline, averaging from 0.3 to 6.9 feet per year, it is obvious that some protection, both physical and regulatory, must be started. Specifically, development along the lakeshore will have to be provided with protection from loss of property through lake erosion and at the same time provision will have to be made for recreational properties for the increasing population.

The mouths of the watercourses and creeks in the extension area, which are used for recreation by residents, will also require attention when runoff increases with urbanization in the upper reaches of the creeks.

Regional Planning

Recent planning reports have indicated a major growth role for the Niagara (South Ontario) Development Region in which the extension area lies. The location on the main transportation corridor of the north-eastern and central portions of the North American continent encourages the establishment of industries which, it is anticipated, will have a great impact on the urbanization of this region. Studies and analysis of proposals for regional development and local government reform are currently being conducted in the Haldimand Norfolk Study under the Ontario Department of Municipal Affairs.

Although it is not expected that traditional urban sprawl will surround the industrial sites, certain centres of urban growth will have to be developed as residential areas for new employees. While it is too early to suggest specific areas for residential developments, in the interim, pressure will undoubtedly be placed on existing urban centres for housing, shopping and recreational facilities. In addition, it is probable that there will be a fairly high conversion of summer cottages to full time use whether they are located along the lakeshore or in the rural setting.

The Big Creek Region Conservation Authority should maintain liaison with the various planning agencies to ensure that detrimental environmental impacts will be minimized. The demands of an increasing population for Open Space and recreational lands, require that lands associated with watercourses and physical hazards be designated and controlled now. This will also provide flexibility for development and design of urban communities.

The Authority should co-operate fully with the Haldimand Norfolk Study group in analyzing and implementing its environmental management recommendations. Technical advice or revision of ongoing programs of the Big Creek Region Conservation Authority should correspond with the Study recommendations.

Registered Fill and Construction Regulations

Section 26(1) of The Conservation Authorities Act enables an Authority to make regulations to control the placing of fill of any kind in specified areas under its jurisdiction. These areas may not be flood plain but may include lands which are deemed by the Authority to require conservation practices. Construction may also be controlled in areas subject to flooding.

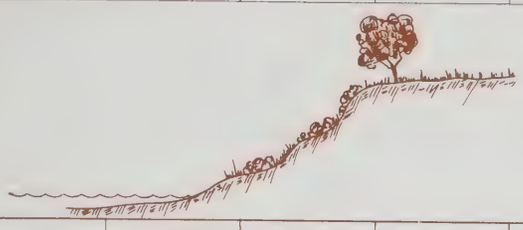
The Big Creek Region Conservation Authority should undertake the delineation of lands which should be protected under the Fill and Construction Regulations. These lands should be defined by careful air photo interpretation with field checks identifying lands susceptible to flooding and erosion, or having steep banks. To ensure consistent policy, the regulations should be drawn up in consultation with municipalities affected, and their full co-operation enlisted in


HAZARD LANDS
LEGEND
HAZARD LANDS
PROPOSED INDUSTRIAL SITES
A
SHORELINE PROFILE REFERENCE
(NOTE: SEE FIG. 5)
EROSION RATES*
OBSERVATIONS (YRS)
TOTAL FEET LOST
(OR GAIN)
AVERAGE LOSS PER YEAR
(OR GAIN PER YEAR)
* SOURCE: LAKE ERIE TASK FORCE
PUBLIC WORKS OF CANADA - 1969
HAGERSVILLE
Nelles Corners
Canboro
Cheapside
Dover Point
A
B
C
D
E
F
G
L A K E E R I E
32
29 40
3
30
5½ 1
3
2 4 6 9
30
10 33
SCALE: MILES

FIG. 4

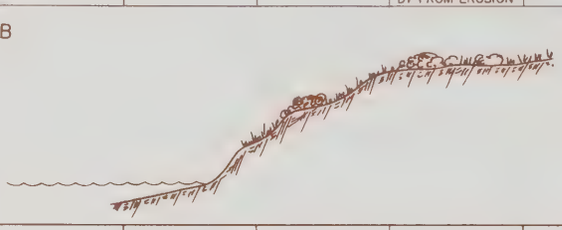
	WET BEACH	DRY BEACH	BLUFF	UPLAND
MATERIAL	LARGE ROCKS AND GRAVEL	LARGE ROCKS AND GRAVEL	HALDIMAND CLAY	HALDIMAND CLAY
WIDTH		0'-15'		
SLOPE	SLIGHT	SLIGHT	MEDIUM	FLAT
VEGETATION			GRASS AND SHRUBS	AGRICULTURAL GRAINS & PASTURE
HEIGHT			10'-30'	
EROSION			SLIGHT	

A



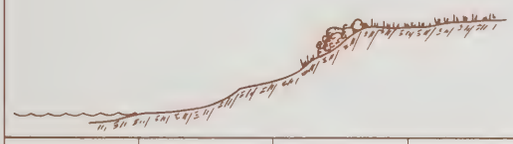
	WET BEACH	DRY BEACH	BLUFF	UPLAND
MATERIAL	SAND AND GRAVEL	NONE	HALDIMAND CLAY	HALDIMAND CLAY
WIDTH				
SLOPE			MEDIUM	FLAT
VEGETATION			GRASS	AGRICULTURAL GRAIN & PASTURE
HEIGHT			10'	
EROSION			WAVES & GROUND WATER WATER MUDDY FROM EROSION	

B



	WET BEACH	DRY BEACH	BLUFF	UPLAND
MATERIAL	GRAVEL, SAND	BOULDERS AND GRAVEL	HALDIMAND CLAY	HALDIMAND CLAY
WIDTH		10'-15'		
SLOPE			MODERATE	FLAT
VEGETATION				GRASS + AGRICULTURAL
HEIGHT			10'	
EROSION			MODERATE	

C

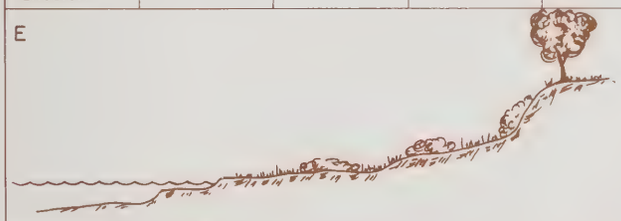


	WET BEACH	DRY BEACH	BLUFF	UPLAND
MATERIAL	BED ROCK, BOLDERS	BED ROCK, SMALL BOULDERS	HALDIMAND CLAY	HALDIMAND CLAY
WIDTH		20'-30'	30'	
SLOPE	SLIGHT		SLIGHT	FLAT
VEGETATION		GRASS, TREES	GRASS, TREES	GRASS + AGRICULTURAL
HEIGHT			10'	
EROSION			MINIMAL	

D

	WET BEACH	DRY BEACH	BLUFF	UPLAND
MATERIAL	BOULDERS BEDROCK	BEDROCK	CLAY, SMALL BOULDERS	HALDIMAND CLAY
WIDTH		20'-40'	30'	
SLOPE			SLIGHT	FLAT
VEGETATION		GRASS AND SHRUBS		GRASS AND AGRICULTURAL
HEIGHT			10'-5'	
EROSION			NONE	

E



	WET BEACH	DRY BEACH	BLUFF	UPLAND
MATERIAL	SAND AND GRAVEL	SAND	CLAY	CLAY
WIDTH		10'-20'		
SLOPE			SLIGHT	FLAT
VEGETATION		GRASSES + SHRUBS	GRASSES + SHRUBS	AGRICULTURAL
HEIGHT			5'-10'	
EROSION			NONE	

F

	WET BEACH	DRY BEACH	BLUFF	UPLAND
MATERIAL	BOULDERS BEDROCK	BEDROCK	CLAY, SMALL BOULDERS	HALDIMAND CLAY
WIDTH		20'-40'	30'	
SLOPE			SLIGHT	FLAT
VEGETATION		GRASS AND SHRUBS		GRASS AND AGRICULTURAL
HEIGHT			10'-5'	
EROSION			NONE	

G

LAKE ERIE SHORELINE ANALYSIS

(NANTICOKE CREEK – EVANS POINT)

NOTE: REFER TO FIG. ...4.....

FIG.5

DEPARTMENT OF THE ENVIRONMENT - CONSERVATION AUTHORITIES BRANCH - G G G - 70

administration and enforcement.

Consultations--Official Plans and Zoning By-laws

The Authority should consult and co-operate with local municipalities when Official Plans and/or Zoning By-laws are adopted or updated, in order that Hazard Lands and Open Space areas may be preserved for public use. Plans and Zoning By-laws should always reflect any designated areas in the Registered Fill and Construction Regulations.

It is recommended that suitable and adequate setbacks be included during consideration of Zoning By-laws relating to the positions of buildings and structures abutting designated Hazard Lands or Open Space areas, or lands designated under the Registered Fill and Construction Regulations. Such a setback should reflect the nature of the hazard. Professional advice is essential.

No building or structure of any kind nor the removal of vegetation or the placing or removal of fill whether originating from on or off the site should be permitted in any setback area without the agreement of the Big Creek Conservation Authority.

EXISTING AND PROPOSED RECREATION FACILITIES

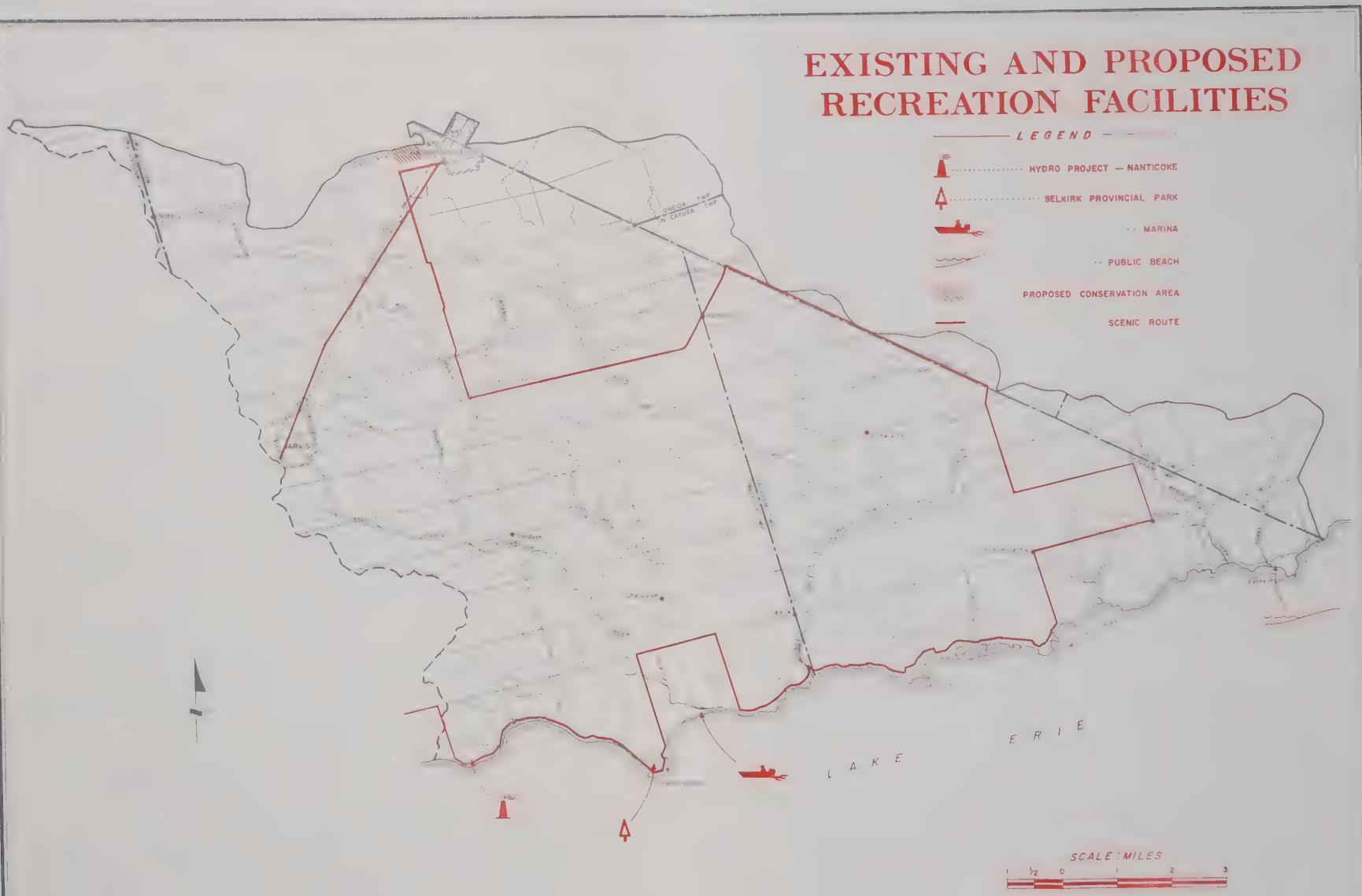


FIG. 6

DEPARTMENT OF THE ENVIRONMENT, CONSERVATION AUTHORITIES BRANCH, T.L.A. 70

CHAPTER 4

RECREATION

The landscape within the former boundaries of the Big Creek Region Conservation Authority is well suited to the development of outdoor recreation facilities, as the success of such areas as the Backus Conservation Area, the Waterford Conservation Area and the Norfolk County Park testifies.

The extension area, however, does not have the same scenic variation and adds only very marginal outdoor recreational potential to the Authority.

This is consistent with the findings of the Haldimand Norfolk Study group.

The former Authority area therefore continues to offer the best opportunities for the high quality recreational development that will be required by an expanding and mobile population.

Existing Recreation Facilities

Currently within the extension area there are a limited number of outdoor recreation facilities. The most notable is Selkirk Provincial Park which offers access to Lake Erie and approximately 165 campsites. In 1969 some 50,000 persons visited this park. A small, privately developed and very heavily used bathing beach near Evans Point also provides public access to Lake Erie. A marina at Woodlawn Park is the only other public facility on the Lake Erie shore within the extension.

Private tourist establishments include cottages, motels and hotels for approximately 150 guests.

Future Recreational Facilities

Uplands and shorelines should be viewed as separate physiographic zones for recreational site development.

A carefully integrated Open Space system will help to ensure the availability of recreational opportunities as demand for them expands.

Generally the upland areas are flat and unappealing and offer little in the way of aesthetic viewing.

Some possible areas for development do exist in and around abandoned quarries. A quarry north-west of Hagersville was considered the most suitable, but extensive improvements are required to convert it to any form of an active day-use recreation area.

Prior to considering acquisition of this site, the Authority should determine that the water flow into the quarry is sufficient to maintain levels for swimming, and that the quality of the water is acceptable for this purpose. If both are satisfactory, provision could be made for a beach area by sloping all or part of one face of the quarry--preferably the north side--by blasting the bedrock and laying sand. Sufficient land would be required to provide parking space and backshore activities such as sunbathing, picnicking and field sports.

Other quarry sites should be considered for such uses as trap and/or skeet shooting. The minimum size required for trap shooting is 100 by 300 yards, while a skeet range requires a minimum site of 300 by 600 yards. Additional space for buffer zones and parking would be necessary.

Such woodland areas as may be eventually acquired, would be useful for such recreational pursuits as nature study, hiking and hunting. Mature or succession forests are especially suitable for these purposes.

Consideration could also be given to the acquisition of a parcel of land of not less than 200 acres in size for use by recreational vehicles such as dune buggies, all-terrain-vehicles and snowmobiles.

Shorelines in the extension area include streamsides as well as the Lake Erie shore, and both are important from the recreational point of view.

However, little shoreline is available for purposes other than viewing. Intensive cottage development is typical of most of the suitable shoreline, while steep bluffs, rapid erosion or rocky or boulder beach render the remainder unsatisfactory for most types of public recreation. More careful planning in areas that may be developed for summer cottages should be reflected in all subdivision proposals, and adequate public shoreline or access to the shoreline should be included in each case.

In areas where shore erosion will force eventual relocation of roads parallel to the shore, the Authority should be alert for opportunities to acquire shoreline.

A well integrated system of public parkland, affording relatively easy access for a large number of people along an extended boundary, should result from co-ordinating zoning with urban and industrial development as detailed in the previous chapter.

The Nanticoke Generating Station is a potentially important attraction. The gigantic smokestack will doubtless attract many visitors to the area.

Driving for Pleasure

Driving for pleasure is an important aspect of outdoor recreation.

A planned scenic drive would also provide a connection between conservation and scenic areas.

This scenic drive should join the "Rainham Parkway" as proposed by J.N. Jackson in his research report "Recreational Development and the Lake Erie Shore." From this eastern junction, the scenic route could follow the Lake Erie shore with vistas of water and beach, swing north on Haldimand County Road 3 to County Road 11, and then west to Nanticoke and the industrial developments. From Nanticoke the drive could proceed west to Highway 6 and into Port Dover, follow the highway north to Hagersville, the Sandusk Road south to Highway 3, then turn east to Nelles Corner and south-east on County Road 21 to County Road 11.

CHAPTER 5

FORESTRY

In general, there is a marked difference between the average acreage and condition of woodlots in the Big Creek extension area and those in other parts of the Authority. This can undoubtedly be explained by differences in landscape which have influenced land use practices.

Between 7 and 8 per cent of the extension area is given over to woodlots. Over half of them are 15 acres or less and therefore are not significant timber-producing assets for their owners.

The larger woodlots, of 70 acres or more, represent just over six per cent of total woodland acreage. Half of these are within two concessions of the Lake Erie shoreline.

The function of the extension area woodlots in a conservation program, therefore, should be primarily to provide shelter, erosion control, and amenities for homes and recreation areas.

The Shelter Effect of Local Woodlands

Mixed farming predominates in the extension area. There is little high-value cash-cropping. Woodland shelter is therefore required for homes, farm buildings and pasturing livestock.

Wind records in the Simcoe area in the period 1962 to 1966 show that the strongest winds are during the winter months. Records also indicate wind-strength sufficient to produce exposure effects on unsheltered buildings. Winds are mainly from west, west-south-west, and west-north-west directions.

The survey showed that the small size of woodlots, their scattered locations and distance from buildings, enabled them to function

as shelter or partial shelter for only just over seven per cent of the rural buildings. This is clearly inadequate.

Local Woodlands and Erosion Control

The surface condition of predominantly hardwood areas depends on the extent to which shade tolerant or intolerant species are present, and whether there has been grazing in the woodlot. If composition is made up primarily of hickory, elm and oak, which are intolerant to root and shade competition, regeneration is lacking and the ground depends on weeds, shrubs and grasses for erosion control cover. Such cover is frequently effective. Where the woodlot consists mainly of sugar maple, white ash, basswood and beech, ground cover has often been reduced or eliminated by grazing.

During the survey, cases were found of serious topsoil disturbance by grazing cattle in woodlots. One of the more serious examples was in a streamside woodlot in Lot 10, Concession V, Walpole Township. This type of woodlot use leads to the damaging of adjacent stream banks.

In many cases, woodlots were too small to have much erosion control effect. Erosion problems are few in undisturbed wooded areas on flat topography--there are some signs of apparently temporary soil disturbance caused by logging, but this is not considered to be significant. In nearly all instances, erosion control would have to take into account not simply woodlands themselved but also both adjacent and upslope land use, and the effects of watercourses running through or beside wooded areas.

Local Woodlots as an Amenity

Woodlots within the extension area are too small and scattered to warrant purchase by the Authority for conservation and management purposes alone. Most woodlands are also surrounded by developed and agricultural land and large scale reforestation may therefore be neither suitable nor feasible. For this reason, local forest conservation should have mainly an amenity function for recreation areas and dwellings.

Woodlot management by the Authority should therefore be largely confined to recreational areas. A number of sites for possible future consideration were noted in Walpole and Rainham Townships.

CHAPTER 6

BIOLOGY

The extension area was examined from September 16 to 18, 1969.

Fishing

The creeks and their tributaries are silted with Haldimand clay and this material is also held in suspension, making the waters very turbid. At the time of examination there had been a prolonged drought, and no flow was observed in any of the streams. Reports from the local Conservation Officer of the Department of Lands and Forests confirmed that none of the streams in the area flow permanently. In their lower sections the streams tend to have permanent muddy pools lying over the limestone bedrock. The water becomes extremely warm in summer, and only a few pike and a few kinds of minnows could tolerate such conditions. It is not considered that fishing in any of the streams is significant, although a few smelt may be caught at the mouths of the streams in spring.

The only area found to be suitable for game fish is the permanent water in the south-west quarry of a group of quarries owned by a company near Hagersville. The water in this quarry (in Lot 12, Concession XIII of Walpole Township) would probably support either largemouth or smallmouth bass. If bass are introduced, forage fish species such as the bluntnose minnow (Pimephales notatus) should also be introduced.

Hunting

All townships in Haldimand County are known as REGULATED TOWNSHIPS, and require special licences for hunting. Too many fences

are of wire, but many dense hedgerows remain.

Notes on game species follow.

Pheasants:	There is a small resident population. Considerable numbers of pheasants are also introduced from the Normandale rearing station each fall. The cover is satisfactory in many places.
Hungarian Partridge:	A few have been reported.
Cottontails:	These are common in the excellent undergrowth which occurs in many areas.
Jackrabbits:	There are good populations and the species is much hunted, chiefly by concerted "drives".
Deer:	There is a small resident population. Two "Deer Crossing" signs were noted on roads.
Ruffed Grouse:	There are a few in scattered woodlots, particularly those containing white cedar. The populations are not considered to be cyclic in this area.
Woodcock:	This is apparently an uncommon bird in this area. A few may nest in the region, and more may be available when the species is migrating southward. The soil is in general too dry and hard for Woodcock habitat.

Effects of Pollution on Wildlife

A committee has been formed to examine problems likely to result from the construction of the Nanticoke Generating Station whose site is in the extension area.

It is therefore simply noted here that plans published by the Ontario Hydro Public Relations Division show that 600,000 gallons

of water per minute will be drawn from Lake Erie for condenser cooling purposes, and that an additional 400,000 gallons of water per minute will be drawn from Lake Erie to mix with the condenser discharge. The total volume of water returned to the Lake will be considerably warmer than the temperature at the intake, and this may well have a serious effect on bass fishing in Long Point Bay.

Areas of present pollution are discussed in the chapter on Water.

Areas of Wildlife Interest

The Lake Erie shore is chiefly limestone with a few sandy patches and is much affected by algae (*Cladophora* and other species).

It therefore attracts large numbers of migrating birds and should be of special interest to bird watchers. However, opportunities are limited by the existence of an almost continuous line of cottages along the Lake Erie shoreline from the eastern boundary of the Big Creek Region Authority to the site of the Nanticoke Generating Station.

The most interesting wildlife area found during the survey was at Lots 11 and 12, Concession V, Rainham Township. A great variety of vegetation is present, and there is a stream course which is dry in summer. A more detailed survey may reveal other such areas.